

SEISENSE Journal of Management  
Vol. 1. Issue 2. May 2018  
DOI: 10.5281/zenodo.1244519



# An Econometric Analysis of Causality between Poverty and Crises in Northern Nigeria

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## Abstract

The study focuses on the analysis of the causality between poverty and crises in northern Nigeria using the Granger causality test and the ARDL bound testing techniques. The study revealed the presence of causality running from poverty to crises and not the other way round as well as co-integration among the pairs. The long-run estimate thus showing poverty exhibiting a positive effect on crises which deviates from the negative relationship obtained in the short-run. The study thus recommends employing poverty reducing mechanism in the region coupled with the overhauling of the agricultural sector as most of the labor force in the region are unskilled which can be easily absorbed in the sector.

## Keywords

Poverty, Crises, Northern Nigeria, Granger Causality, ARDL Bound Testing to Co-integration

## Introduction

With the average of 73.83% incidence of absolute poverty in Northern Nigeria (North-central, North-East and North-West) compared to 63.3% in the southern part of the country (NBS, 2012), coupled with series of attacks, crises, conflicts and the most recent Boko Haram insurgency cum herdsmen-farmers clash in the region. Although, it is generally agreed among scholars that there is a relationship between poverty and conflicts, there still exist several views on the nature of this relationship (Onuoha, 2007 in Odusote, 2016). While some assert that crises or conflicts is caused by poverty (Gurr, 2005 in Odusote, 2016) others argued that reverse is the case (Lewis, 2014). In either case, it is important to note that between 1967 to date, Nigeria have witnessed several

conflicts and crises and majority of the crises are hosted in the northern part of the country. The most important among them is the Boko Haram crises which is on-going. With regard to the numerous conflicts and the Boko Haram menace in particular, the country's stability is under constant threat, ranging from killings and massacre of hundreds of thousands of people, destructions of houses and properties and the kidnapping of over 200 Nigerian school girls by the dreaded militant al-Qaeda affiliated group, Boko Haram (Ahmed, 2014). According to late Prof. Sabo Bako of Ahmadu Bello University, the 1980 Maitatsine set in Northern Nigeria serve as the precursor to Boko Haram. This is because most of the members of the terror group include victims of ecological disasters which left them in "a chaotic state of absolute poverty and social dislocation in search of food, water, shelter, jobs, and means of livelihood". Significantly, the Boko Haram menace exist mainly in the Northern Nigeria, hence, a close study on the livelihood of people in northern Nigerian will show a relationship between poverty and crisis. Although, it is generally shown that poverty exist in Nigeria yet greater of its incidence is in the northern part of the country. Thus, the high incidence of abject poverty, abysmal low literacy rates, and the feelings of insecurity in the region aid in providing human resources and safe haven for Boko Haram (Ahokeh, 2012 in Oduote, 2016). Accordingly, the level of disillusionment, discontent, poverty, unemployment and the high proportion of children of school age out of school in Northern Nigeria which is higher than any other part of the country gave rise to Boko Haram and other ethno-religious related crises in the region (Oduote, 2016). Although Boko Haram insurgency and most of the crises and conflicts experienced in Northern Nigerian is religiously driven, poverty is ultimately perceived to be the cause. The northern part of Nigeria which occupies almost 70% of the total land mass and where Boko Haram hail from, about 70% of the population live on less than a dollar a day, which is about 20% higher than the already dismal rate in the south which is also accompanied by endemic rates of illiteracy, illness, infant mortality, unemployment and ultimately the challenges of insecurity (DailyPost, 2015). David Francis, one of the first western reporters to cover Boko Haram, noted that most of the foot soldiers of Boko Haram aren't Muslim fanatics, instead they are poor kids who were turned against their corrupt country by a charismatic leader (Ahmed, 2014), while some *Almajiris* are paid as little as N300 to launch attacks (Alexsamade, 2012). Therefore, the high incidence of poverty as well as deprivation in the region can be rightly said to be the forerunner of insecurity in the region.

This paper apart from the introductory part is organized as follows; literatures relating to poverty and crises will be reviewed extensively in section two, methodology employed for this paper will be discussed in the third section. In section four results obtained will be presented and discussed while conclusions and recommendations are made in section five.

## Literature Review

Poverty is a creature with many heads and several tails, as is crises. While the different heads would refer to the different forms poverty and crisis can assume in society, the tails dragging behind would refer to the consequences, influences and the effects of crises or poverty on society. Theoretically, crisis has positive effects on poverty, that is, crises engulf poverty. This is because crises lead to loss of property, social development assets,

spread of diseases, absent or lack of market, internal displaced persons and loss of global economic confidence of the nation etc. but in the case of poverty it might be difficult to identify any positive effects on human existence.

Poverty on the one hand refers to the inability to access basic needs such as food, water, shelter, education, etc. which is usually due to low income or some unhealthy situations to offset this basic needs (Hussein and Filho, 2012). Crisis on the other hand is an emotional and physical response to some precipitating event or series of events that disrupts our normal day-to-day functioning. Crisis may arise from the process of seeking peace, progress, satisfaction. It also arise from misunderstanding, oppression, or failure to reconcile divergent views, beliefs, and interests. Forms of crisis (or conflict) thus include; domestic crisis, family crisis, intra-personal crisis, social crisis, religious crisis, and armed crisis (Odusote, 2016). Thus the inability to access basic needs can pave ways to crises in a society. When people face crisis, it leads to many medical problems like muscular pain, headache, stress, high blood pressure some lead to loss of life and many other things.

Once people fall into the trap of poverty, they remain there as they lose their strength because of not taking enough food. Hence, not having enough energy to work hard and produce more which can give them more money to increase their purchasing power. This vicious cycle goes on until someone from outside come in to take them out of this cycle. This thus shows that poverty and crisis are intrinsically linked, and if we really are to see an end to poverty in all its forms everywhere, we must develop and invest in a holistic set of financing tools and sustained investment to address the causes and long-term consequences of crises. Continued efforts to strengthen and address information gaps on levels of poverty and people's needs in crisis contexts will also be critical. In many high-risk settings, true levels of poverty are simply unknown and national figures may miss pockets of subnational crisis.

The link between poverty and crisis (or conflicts) is complex and multi-dimensional. It led to scholars having different views on the link. While some scholars opined that poverty and crisis are related, due to the destabilizing effects that perennial inequalities, social exclusion, scarcity of resources, religious strife, and poverty have on the society, others were of the view that poverty and crisis are never related. They contend that poverty can only lead to crisis (or conflict) when other non-economic factors including ethnic composition and political decay are present (Odusote, 2016). Apart from the ethno-religious crises and the dreaded Boko Haram terrorists in the Northern part of Nigeria, clashes among nomad (Fulani herdsman) and the settled farmers has thus been a significant source of crises in the region in recent times, due to increased competition of pastoralists for a dwindling 'stock' of grazing land which is perceived to be "scarce" or "limited in supply". This crises have made local authorities in certain states to expel pastoralists, as the conflicts have registered a negative effects on economic activities in the region accompanied with loss of fortunes, lives and properties (Odoh and Chigozie, 2012). The emergence of Boko Haram in North-eastern Nigeria was inspired by both an internal and external metaphors. Internally, factor such as lack of good Governance in the country, specifically in the region transformed into economic decay, destitution, exclusion and ultimately, poverty which thus made the radicalization of Boko Haram to strive. Externally, it can be viewed in two different sides; first which is characterizes by the global Islamic jihad and its link with international terror groups such as Al-Qaeda,

Al-Shabaab or AQIM, second, it can be seen as conspiratorial, a grand strategy to achieve the predicted disintegration of Nigeria (Mbah, Nwangwu, and. Edeh, 2017). Accordingly, dwindling living standard of Muslim-dominated country and the US and its allies' declaration of war against terror which gave rise to global resurgence of radical Islamist organizations such as ISIS, AL-QAEDA, AQIM, AL-SHABAB among others also stimulates the sect externally. On views of the problem essentially as internal, socio-economic factors (such as poverty, unemployment, illiteracy, discrimination, and economic marginalization) as well as deep-seated religious differences and animosity in the Nigerian society is seen as the driving force. The high incidence of poverty in the region and other socio-economic factors are used as mobilizing instrument to recruit for terrorist activities (Mbah, Nwangwu, and. Edeh, 2017).

Youth of Northern Nigeria have been denied choices and opportunities to go to better schools, hospitals, houses, basic social life as well as participate actively in the society. In view of these they may join any violence groups as majority of them are ill informed politically, socially, religiously, economically etc. It is thus hard to disprove this as most of the arm robbers, terrorist groups, Boko-Haram Members particularly the foot soldiers came from poor masses (Tella, 2015). More than 70% of the population in Northern Nigeria living below the poverty line of \$1.90 daily, it is easy to see how any demagogue or religious extremist can mobilize the poor, destitute and youth unemployment, especially within the growing stratum of university graduates as instruments for his own political goals. When people are pushed to the lowest levels of desperation and hopelessness, they can fall easy prey to religious demagogues who offer them a sense of belonging (Muzan, 2014).

Consequently, these crises and insecurity of economic, social, religious and political environment have been negatively affecting the life of people in Northern Nigeria. In view of crises in the region, commercial activities have been paralyzed while human resources have flee (migrated) to a safer place to avoid either being killed, kidnapped or abducted, thereby limiting the supply of basic needs, causing inflation (rise in prices of goods and services in the region). This further reduced the revenue of governments in the region.

A little empirical emphasis have been made to support the causal relationship between poverty and crisis. In Nigeria, much emphasis are made on its theoretical perspective, although a few were based on Northern Nigeria (see Tella, 2015; Odoh and Chigozie, 2012; Ibrahim and Haruna, 2014; Ibrahim, 2015; and Akubor, 2016), others capture the whole country (Nigeria) or the southern part of the country (see Alozieuwa, 2016; Mbah, Nwangwu and Edeh, 2017; Muzan, 2014; Odusote, 2016; Joshua, 2013; Ikejiaku, 2012; and Awojobi, 2014).

A few empirical evidence made such as that of Ajodo-Adebanjoko and Walter (2014) in which the relationship between poverty, conflict and insecurity in Nigeria was examined. This was with particular reference to conflict-ridden areas of the North-East, South-South and Middle-Belt, thus using Secondary data from the National Bureau of Statistics (NBS). The study discovers a bidirectional movement of causality between poverty and conflict and corresponding proportionate relationship between the pairs, which therefore confirms the theoretical assertions of previous works. Similarly, Adebayo, Olagunju, Kabir and Adeyemi (2016) investigated on the several ways in which the activities of Boko Haram terrorist activities have threatened food security as well as intensifying food

poverty in Northern Nigeria. Using descriptive statistics and ordered Probit model to analyze the 2009/2010 Harmonized Nigeria Living Standard Survey (HNLSS) data, the study discovered that 84.85% of the households in Northern Nigeria are food poor in which majority are rural households with uneducated male headed households. The terrorist activities of Boko Haram have negatively impacted on the wellbeing of Northern Nigerians as well increasing food poverty extremely in the region. Umaru, Pate and Haruna (2015) as well studied the Impact of Insecurity and Poverty on Sustainable Economic Development in Nigeria with special emphasis on the Boko Haram insurgency using OLS and ECM technique to estimate the relationship between economic growth, insecurity and poverty; and OLS to estimate the relationship between insecurity and poverty respectively, while the Granger Causality is employed to establish the movement of causality in the model. The study thus discovered the existence of the negative influence of poverty and insecurity on the growth of Nigerian economy as well as a proportionate relationship between poverty and insecurity, while the Granger Causality result revealed a unidirectional movement of causality between poverty and insecurity.

Obviously, the few studies which provided empirical support to the subject matter captured the entire country (Nigeria), very little focused exclusively on Northern Nigeria. Although some focused on only food poverty, others capture the influence of both poverty and conflicts (or crises) on the growth of Nigerian economy. Accordingly, most of the studies did not test for the stationarity of data used for the analysis (see Olagunju, Kabir and Adeyemi, 2016; and Umaru, Pate and Haruna, 2015) which might contain data which are not stationary and require differencing either once or twice. Thus relying on result from such analysis might be misleading since analysis with non-stationary data might generate a spurious regression result. Similarly, the negligence of important post-estimation test such as serial correlation, heteroscedasticity test, model stability test, etc. to ensure the model is free from these problem as well stable (Adebayo, Olagunju, Kabir and Adeyemi, 2016; Umaru, Pate and Haruna, 2015; and Ajodo-Adebanjoko and Walter, 2014), have made it hard to rely on these previous studies as policy option and for ascertaining of causal relationship among the pairs (poverty and crises) in Northern Nigeria. The findings of Adebayo, Olagunju, Kabir and Adeyemi (2016) would have been sufficient for policy option as well ascertaining the causal relationship between poverty (food poverty) and social crises in Northern Nigeria. But because the unit root test and other important post-estimation tests and diagnosis were not undertaken, which would have been suitable to capture the causality between the pairs as well determine the short-run and long-run movement. Therefore stationarity test will be undertaken in this study and as well perform the necessary tests and diagnosis. Accordingly, the study will employ the suitable estimation technique to determine the causal relationship between poverty and crises in Nigeria.

## Methodology

From literature reviewed, poverty is said to be the causal factor of crises in Northern Nigeria. Therefore, the functional relationship between poverty and crises in Northern Nigerian can be presented as thus;

$$CRISES = f(POV) \quad (1)$$

Where *CRISES* represent the series of ethno-religious crises, political riots, herdsmen-farmers clash, Boko Haram terrorism activities, etc. in Northern Nigeria; and *POV* is the percentage of the population that are poor in Northern Nigeria. Due to the unavailability of data on the series of crises and conflicts in Northern Nigeria and Nigeria as a whole, since in each crisis casualties are usually recorded, we employ the method for measuring the *death rate* of a specific cause of death, which it is given as;

$$\text{Cause of Specific Death} = \frac{ND}{TP} \times 1,000$$

Where *ND* denotes the number of deaths due to the particular cause; and *TP* denotes the total mid-year population. This technique for measuring crisis is guided by the fact that crisis is usually followed by casualties. Crises will thus be calculated by dividing the total number of people that die in a specific year as a result of crises in northern Nigeria by the total mid-year population of northern Nigeria (North-central, North-west and North-east) multiplied by 1,000. That is;

$$\text{Crisis} = \frac{\text{Number of Death due to crisis}}{\text{Total mid - year population}} \times 1,000$$

From the computation, we thus obtain the number of deaths as a result of crises in Northern Nigeria occurring during the year, per 1,000 population estimated at midyear. In a year that crisis is not recorded, the year automatically takes the value zero. Thus for empirical analysis, **Eqn. (1)** is developed as thus;

$$CRISES_t = a_0 + b_1 POV_t + \mu_t \quad (2)$$

Where;  $a_0$  is the intercept;  $b_1$  is the slope coefficient;  $t$  denotes the number of time series observations; and  $\mu$  is the error correction term. In line with the objective of the study, we test the presence of causality between poverty and crises. The existence or correlation between series might not mean the presence of causality among the series. Thus to test for causality among the series we specify the following VAR (Vector Autoregressive) model corresponding to **Eqn. (2)**.

$$CRISES_t = \alpha_0 + \theta_i \sum_{i=0}^n CRISES_{t-i} + \delta_i \sum_{i=0}^n POV_{t-i} + v_{t1} \quad (3.1)$$

$$POV_t = \alpha_0 + \lambda_i \sum_{i=0}^n POV_{t-i} + \beta_i \sum_{i=0}^n CRISES_{t-i} + v_{t2} \quad (3.2)$$

Where  $v_{t1}$  and  $v_{t2}$  are error correction term in both model; other identities as previously specified. We then test the pairwise causality between the variables in the model, by testing the null hypothesis that the parameters ( $\delta_i$  and  $\beta_i$ ) in the two models are jointly equal to zero which is a test that there is no pairwise Granger causality among the series, against the alternate hypothesis that there exist Granger causality among the series. The f-statistics obtained from the equating the parameters of the X variable to zero with the corresponding p-value is then used for inference, either to accept or reject the existence of Granger causality among the series.

Accordingly, after establishing the presence of (non-) causality among the series, we test for the presence of unit root (non-stationarity) in the variables, so we won't be generating

a spurious regression result. We estimate ARDL (Autoregressive Distributive Lagged) model bound testing approach if the series are integrated of different orders not more than 1, so we can observe the effect of the past value of the response variable in the current year since the response of the dependent variable to sets of explanatory variables usually takes the lapse of time. As such, we check for the existence of co-integration among the series by employing the ARDL Bound testing approach. Else, if the variables are jointly integrated of order 1, we employ the ECM (Error Correction Model) to tie the short-run behavior of the variables to their long-run equilibrium behavior. Thus if the variables are jointly integrated of order 1, we estimate;

$$CRISES_t = a_0 + b_1 \Delta POV_t + \theta (CRISES_t - a_0 - b_1 POV_t) + \mu_t \quad (4)$$

Or

$$CRISES_t = a_0 + b_1 \Delta POV_t + \theta \varepsilon_{t-1} + \mu_t \quad (5)$$

Where;  $\theta$  is the coefficient of one year past error correction term  $\varepsilon_{t-1}$ . Instead of estimating **Eqn. (5)**, if the variables are integrated of different orders not more than 1, we estimate;

$$CRISES_t = a_0 + b_2 \sum_{i=0}^n \Delta CRISES_{t-i} + b_2 \sum_{i=0}^n \Delta POV_{t-i} + \theta \varepsilon_{t-1} + \mu_t \quad (6)$$

Therefore, for ARDL bound testing for co-integration, the conditional ECM whose levels parameters will be used to test the null hypothesis of *no co-integration* against its alternate hypothesis based on comparing the value of the test statistics obtained from equating the levels parameters to zero with the upper and lower bound critical values provided by Pesaran, Shin and Smith (2001)

$$CRISES_t = a_0 + b_2 \sum_{i=0}^n \Delta CRISES_{t-i} + b_2 \sum_{i=0}^n \Delta POV_{t-i} + \partial_1 CRISES_{t-1} + \partial_2 POV_{t-1} + \mu_t \quad (7)$$

Where **Eqn. (7)**, is the conditional ECM;  $\partial_1 - \partial_1$  are the coefficient of the levels variables in the model. As the study implies, time series data will be employed. Data on poverty will be collected from Nigeria's National Bureau of Statistics (NBS), while data on crises will be computed based on the measurement technique specified above, thus the number of casualties involved in crises such as the massacres, religious crises, Herders-farmers clashes, the *Shi'ites* versus Nigeria Army clash (in Kaduna) and the Boko Haram insurgency in Northern Nigerian will be collected from Wikipedia (2017) and Premier Times (2016) respectively. Accordingly, data on Northern Nigeria population which will be used to compute proxy data for crises will be collected from World Development Indicators (WDI). The data will span from 1980 to 2016 capturing from the *Maitatsine* religious crises of 1980s to the current Herders-Farmers clashes and Boko Haram terrorist activities.



## Results and Discussion

### Stationarity Test

Table 1- Result of Unit Root Tests

Variables	ADF	PP	5% Critical Value	Order of Integration
<b>CRISES</b>	-8.965275*	7.999526*	-2.945842	I(0)
<b>POV</b>	-5.683803**	-6.273968**	-1.953381	I(1)

Assumptions - \*(intercept only) and \*\* (no intercept and trend)

It is important to ascertain the stationarity status of the variables entering the model, for Granger (non-) causality and regression analysis respectively. This will serve as a guide for the model that will suit the series, as stated in the previous section. Again, it will prevent us from obtaining a spurious regression result if the series are not stationary (have unit root) and we assume them to be all stationary. Thus, as a measure for checking the presence of unit root (non-stationarity) in the series, we employ the popular Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests. Under tests, the null hypothesis that a series have unit root (not stationary) is tested against the alternative that a series do not have a unit root (stationarity). The null hypothesis which is thus rejected when the value of the test statistics exceeds the critical values at either 1%, 5% or 10%, which is a case that the series is stationary. We fail to reject the null hypothesis when the test statistics lies below the different critical values, and this denotes the non-stationarity of the series. If a series is not stationary at levels, differencing once (or twice) can make the series stationary. From the result obtained from both tests (ADF & PP) as shown in **Table 1**, the series (*CRISES* and *POV*) are stationary at different order, that is while *CRISES* is stationary at levels (I(0)), *POV* was found not to be stationary at levels, but made stationary after first differencing (I(1)). As stated above in the previous section, since the series are integrated of different orders (I(0) and I(1)) not more than 1, we thus employ the ARDL bound testing approach for co-integration. Before performing the ARDL bound testing approach to co-integration, we test for the pairwise (non-) causality among the series based on the VAR model specified in **Eqn. (3.1) & (3.2)**.

Table 2- Pairwise Granger Causality Tests

Null Hypothesis:	Lags	Obs.	F-Statistic	Prob.
POV does not Granger Cause CRISES	1	29	6.21712	0.0193
CRISES does not Granger Cause POV			0.08449	0.7736

Source: Author(s) Computations Using E-Views 7

As presented in **Table 2** above, the resultant f-statistics obtained from equating the coefficient of the explanatory variable (excluding the lagged values of the response variable) to zero under the null hypothesis which denotes non-causality among the series



in **Eqn. (3.1)** & **Eqn. (3.2)**, based on maximum lag selection 1. Therefore, from **Table 2** above, we reject the null hypothesis in **Eqn. (3.1)** based on the resultant f-statistics and its corresponding probability values, while we fail to reject the null hypothesis in **Eqn. (3.2)**. We can therefore conclude based on the Granger causality test results in **Table 2** above that there exist a one-way Granger causality from poverty (*POV*) to Crises in Northern Nigeria (*CRISES*), but not the other way round. This result as such parallel with the empirical findings of Umaru, Pate and Haruna (2015) and Ajodo-Adebanjoko and Walter (2014) that poverty Granger causes crises in Northern Nigeria. Although there exist a one-way causality running from poverty to crises in Northern Nigeria but not the other way round in Umaru, *et al.* (2015), the empirical findings of Ajodo-Adebanjoko and Walter (2014) shows bi-directional causality between poverty and Crises in Northern Nigeria. This then mean that people tends to vulnerable when they have been denied access to basic needs of the societies.

### ARDL Bound Testing for Co-integration

As shown in the first phase of this section, the series (*CRISE* & *POV*) are integrated of different orders (I (0) & I (1)), hence we employ the ARDL Bound testing to co-integration approach. The approach as specified in the previous section is concerned with the comparison of the f-statistics obtained from equating the coefficient of the levels variables in the conditional ECM with the critical values provided by Pesaran *et al.* (2001), which is thus used to test the null hypothesis of *no co-integration* against the alternate hypothesis of the existence of co-integration among the series. The null hypothesis of *no co-integration* is rejected when the value of the test statistics obtained exceeds the upper bound (I (1)) of the critical values, while we fail to reject the null hypothesis when the test statistics falls below the lower bound (I (0)). We fall into the region of indecision when the test statistics fall between the lower bound (I (0)) and upper bound (I (1)).

From the results of the ARDL bound test to con-integration presented in **Table 3**, with the test statistics (f-statistics) value (7.301909) being greater than the upper bound values at 5% and 10%, we can therefore reject the null hypothesis of *no co-integration among the series*, thus conclude that there exist co-integration (long-run relationship) among the series (*CRISES* and *POV*). As such we can estimate the long-run level regression to ascertain the size of the parameters in the model.

**Table 3- Result from Bound Test**

Dependent Variable		Function		$k - 1$	F-Statistics
<i><b>CRISES</b></i>		<i><b>f(CRISES/POV)</b></i>		1	7.301909
Asymptotic critical value bounds for the F-statistic (Pesaran <i>et al</i> (2001) Case III)					
1%		5%		10%	
I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
6.84	7.84	4.94	5.73	3.17	4.14

Source: Author(s) Computations Using E-Views 7

## Discussion of Long-run and Short-run Estimates Results

Haven confirm the existence of co-integration among the series using the ARDL bound testing approach, as well as one-way Granger causality running from crises in Northern Nigeria to poverty in Northern Nigeria, it is worth estimating the long-run and short-run model for the study so as to empirically ascertain the size of the correlation among the series as well as the speed at which they converge in the long-run equilibrium. The long-run model which is thus analogous to **Eqn. (2)** is presented in **Table 4**.

### Dependent Variable: *CRISES*

Table 4- Long-Run Estimates

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	-0.014039	0.006606	-2.125356	0.0425
<i>POV</i>	0.000451	0.000169	2.662983	0.0127
$R^2 = 0.204647$ , Adj. $R^2 = 0.176242$ , F-statistic = 7.204514, Prob(F-statistic) = 0.012075, Durbin-Watson stat = 1.489113				

Source: Author(s) Computations Using E-Views 7

From the long-run estimates in **Table 4**, the intercept (which represents the value of the response variable when the explanatory variable in the model is assumed fixed) and poverty in Northern Nigerian are both strongly statistically significant. The  $R^2$  value in **Table 4** thus signifies that poverty although significantly explains the crises in Northern Nigeria is but not the only factor responsible for Crises in Northern Nigeria. Poverty in Northern Nigeria contributes only 21% to the cause of Crises in the region. In-line with this, the coefficient of the constant term indicates that when poverty as a factor causing crises in the region is assumed fixed, crises will (as measured by the death rate of people that die as a result of crises) decline by 1.4%. This negative sign which the constant term takes in this study deviates from that in Umaru, *et al.* (2015), in which crises is *self-aggravating* without the poverty. Accordingly, poverty in Northern Nigeria poses a positive relationship with crises in the region. On average, for a percent change in the level of poverty in Northern Nigeria will cause crises (as measured by the death rate from the crises) in the region to increase by 0.0451 percent. This thus signifies that poverty is responsible or rather an influencing factor of crises in Northern Nigeria. This result corroborates with the empirical findings of Umaru, *et al.* (2015) and Adebayo, *et al.* (2016), and the theoretical assertions of Odoh and Chigozie (2012), Ibrahim and Haruna (2014), Tella (2015), Ibrahim (2015) and Akubor (2016). The significance of the long-run estimates of poverty in explaining crises in Northern Nigeria thus verifies the fears and assumption of policy makers In terms of the growing rate of poverty in the region coupled with the timeline of major crises which had been and currently launched in the region.

In the same vein, the long-run estimates of the model as presented in **Table 4**, is analogous to the short-run estimates in **Table 5**. The short-run estimate in **Table 5** is

estimated using the ARDL-ECM technique which corresponds with **Eqn. (6)**. The optimum lag length of ARDL (1, 0) is based on *Schwarz criterion* model selection criteria. Accordingly, the diagnostic tests (post-estimation tests) for autocorrelation, heteroscedasticity, normality and model stability as presented in **Table 6** shows that our short-run model does not violate the classical linear assumption of *no auto/serial correlation* and *homoscedasticity*, although the model is not normally distributed as shown by the *Jaque-Bera statistics* in **Table 6**. The model stability tests (Ramsey RESET, CUSUM test and CUSUM of Square) as such shows that the model is stable, thus correct for predictions. Similarly, the one period lagged error correction term ( $\varepsilon_{t-1}$ ) is rightly stated as it is negative, less than 1 and highly statistically significant.

From the short-run estimates in **Table 5**, similar to the long-run estimates, the constant term is as well negative, although not statistically significant even after including the lagged value of crises in Northern Nigeria as a possible determinant of crises in the current period. The value of the constant term thus denote that crises in the past year and poverty although are significant in predicting the causal of crises in the region in current period, other factors also contributes to crises in Northern Nigeria. The inclusion of the past value of crises in the region as a determinant of crises in the current period led to the  $R^2$  being 0.35 (35%) against the 21% in the long-run estimates due to absence of the past value of crises and other factors which causes crises in the region.

Accordingly, the on year past value of crises in Northern Nigeria poses a positive and significant effect on crises in the region. On average, changes in crises (as measured by death rate as a result of deaths in the cause of crises in Northern Nigeria) in one year past will cause crises to increase by 1.2144 in the current period. This result follows the empirical findings of Ajodo-Adebanjoko and Walter (2014). Most crises in Northern Nigeria are reprisal of previous crises. Crises in Jos, Kaduna, etc. arouse with the intent of retaliating or revenging the course of previous crises, majorly ethno-religious crises. Ordinarily, *war begat wars*, thus *crisis also begat crises*. The only way to prevent the reoccurrence of crises is to *curb* the initialization of the first crises, else more crises tend to surface as a reprisal for past crises.

Similarly, in the short-run analysis in **Table 5**, poverty rate in Northern Nigeria although not statistically significant, negatively induce crises in the region. This thus deviates from the long-run estimates in which poverty and crises in the region exhibits positive relationship. The short-run estimates for poverty thus denotes that for a percent changes in poverty in the region, crises will decline by 0.00993 percent. What is obtainable in the short-run estimates in **Table 6** thus deviates from the empirical findings of Ajodo-Adebanjoko and Walter (2014), and the theoretical claims of Ibrahim (2015), Ibrahim and Haruna (2014) and Tella (2015).

As expected, the one year lagged error correction term  $\varepsilon_{t-1}$  which measures the speed of adjustment towards long-run equilibrium is less than 1, negative and highly statistically significant. The coefficient of the error term being 0.95 thus denotes that, the disequilibrium or deviations in crises in Northern Nigeria will be corrected towards long-run equilibrium at the speed of 95% each year. Overall, on the one hand, in the long-run as it is obtainable from the long-run estimates in **Table 4**, poverty and crises exhibits a positive relationship, which means changes in poverty is likely to cause crises in the region to increase. On the other hand, poverty poses a negative relationship with crises in the short-run, meaning instead of poverty posing as a crises triggering factor as in the

long-run, it acts as decline factor of crises in the short-run. Although, crises in the past year is shown to be the main ignitor of crises in Northern Nigeria in the short-run.

### Dependent Variable: *CRISES*

Table 5- Short-Run Estimates

Variable	Coefficient	Std. Error	t-Statistic	Prob.
<i>Constant</i>	-0.000817	0.003737	-0.218676	0.8287
<i>CRISES</i> (-1)	1.214435	0.378976	3.204514	0.0037
$\Delta POV$	-0.0000993	0.000320	-0.310391	0.7588
$\varepsilon_{t-1}$	-0.945359	0.415499	-2.275237	0.0317

$R^2 = 0.345657$ , Adj.  $R^2 = 0.267136$ , F-statistic = 4.402083, Prob(F-statistic) = 0.012833,

Durbin-Watson stat = 2.100707

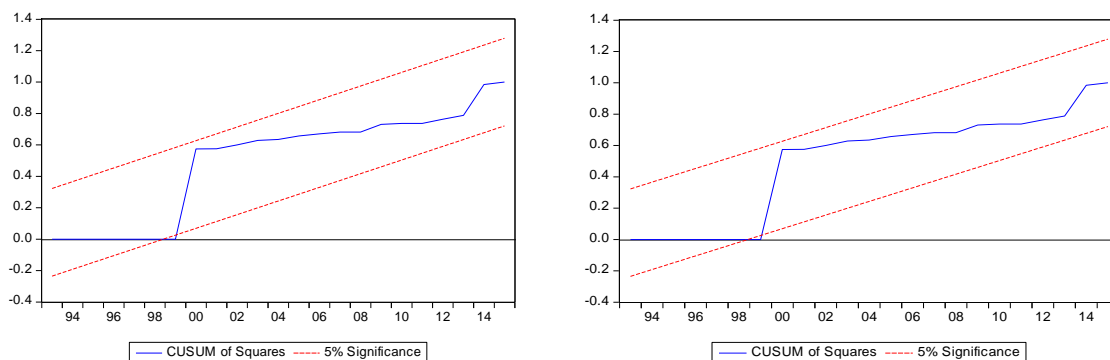
Source: Author(s) Computations Using E-Views 7

Table 6- Diagnostic Tests

Test Statistics	Result
Autocorrelation: Chi-Sqr(1)	0.2562 (0.9557)
Heteroscedasticity: Chi-Sqr(3)	4.259913 (0.2347)
Normality: Jaque-Bera	45.37721 (0.000000)
Functional Form: Ramsey RESET F-stat(1,24)	0.994702(0.3285)

Source: Author(s) Computations Using E-Views 7

Figure-1: Diagnostics Graphs



CUSUM and CUSUM of Square

## Conclusion and Recommendations

The ever growing percentage of poverty among the populace in Northern Nigeria coupled with the series of major crises in the region deem it fit to examine the presence of possible link between the two. For this purpose, the study after rigorous test and diagnoses, uses the number of casualties resulting from the crises in the region to measure the death rate which is used to proxy crises in the region due to absence of data for crises, while data on poverty was collected from NBS, both ranging from 1980 to 2016. The Granger Causality technique and ARDL bound test for co-integration approach was employed to ascertain the existence of causality and long-run relationship between poverty and crises in the region respectively. The result obtained from Granger Causality and ARDL bound testing approach to co-integration thus suggest the existence of one-way Granger causality running from poverty to crises but not the other way round, and the existence of long-run relationship between poverty and crises in Northern Nigeria. Accordingly, from the long-run estimates, poverty poses as a trigger to crises in the region, while acting otherwise in the short-run estimates, although past year crises poses also as a stimulator of crises in the current year. The result thus explains the existence of long-run and causal relationship between the pairs.

Therefore, based on the result obtained from this study, the following recommendations are proffered;

The policy option for policy makers, especially the government of the 19 Northern states with the aid of the central government is to work towards curbing poverty problem in the region, and this is obtainable by providing and creating jobs for the youths.

Additionally, since the agricultural sector have the ability to absorb the growing population more than any sector in the economy, the sector should be further strengthened since most of the unemployed labor force in the country are unskilled labor. Similarly, since crises in the past year act as causal factor of crises in the current year, proactive actions should be carried out towards possible crisis in the region.

In the same vein, since most of the crises in the region are religiously driven, the clerics of the two major religion in the country should be addressed towards preaching provocative and hate speeches which are likely to stimulate crises.

Finally, in the bit to curb crises in the region, the security agencies should be strengthened so as to act as guard against likely occurring crises in the region.

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